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ABSTRACT

A study examined student mastery of meaning and use in reading and composing of five formal logical connectors (moreover, accordingly, hence, even so, and still) across school level and class type. Subjects were 100 remedial and nonremedial students from a high school, vocational college, and university who were asked to give a synonym for each connector and to generate a compound sentence using the connector. The proportion of synonym and sentence errors according to connector type and student class level was not significant. However, the proportion of total errors made by all class levels and the proportion of unattempted items by connector type and class level were significant. The order of difficulty of the five connector types--from least to most difficult--was (1) "still," and "hence," (2) "even so," (3) "accordingly" and "moreover." Although a developmental trend was indicated for acquiring control, students in general had not mastered the connectors needed for literacy by the time they were in college. (Author/FL)

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STUDENT USE OF SELECTED FORMAL LOGICAL CONNECTORS ACROSS SCHOOL LEVEL AND CLASS TYPE

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Over the years the scientific study of language has changed from initial concerns with phonology, morphology, and single sentences to recent concerns with multisentence texts (Frederiksen, 1972; Grimes, 1972; Kintsch, 1974; Beaugrande, 1980). There is now, in addition to longer language samples, an emphasis on naturally occuring texts, production, and comprehension processes (Clark & Clark, 1977; Flower & Hayes, 1979). Those reading comprehension and composing process models that use the miltisentence text as their basic unit are concerned with how readers and writers integrate information across sentences.

Both readers and writers need to follow rules for making sentences fit together; these rules tend to generate prose that is easy to comprehend. Writers must adhere to the rule for the serial order of old and new information, presenting the most important and the new information at the end of the sentence and dovetailing the new with the old (Eastman, 1970). They must repeat key words and concepts and have adequate pronominal referents and few different concepts (Kintsch, 1975). Another important device for integrating ideas across sentences is the use of logical connectors. Intersentential logical connectors establish the relationship between sentences, relating the sentences of a paragraph to each other much as verbs relate the constituents of a sentence. In cases where the connector does not appear in the text, the reader must infer the relationship between the sentences by drawing on his knowledge of the referential situation. The integrative process should take less time when

connectors appear and also make the inference process unnecessary (Carpenter & Just, 1977; Robertsen, 1968). The placement of the old and new information, the use of repetition, anaphoric reference, and the intersentential logical connectors all signal how ideas are related in the text and how the reader should process the text in order to comprehend it. Thus, these devices should be included in any adequate processing model.

Connectors can be classified in terms of the intersentential relations they establish. The following list (Brooks & Warren, 1970; Eastman, 1970) provides a representative analysis of connectors:

- To show that the same topic continues: this, that, these, such.
- To introduce another item in the same series: another, again, a second, further, furthermore, moreover, similarly, likewise, too, and, finally, also.
- To introduce another item in a time series: next, then, later on, afterwards, finally.
- To introduce an example or illustration of what has been said: for instance, for example, specifically.
- To introduce a consequence of what has been said: hence, accordingly, thus, therefore, then, consequently, so, as a result.
- To introduce a restatement of what has just been said: in other words, to put it differently, that is to say.
- To introduce a concluding item or summary: finally, altogether, all in all, the point is, in conclusion, to summarize.
- To introduce material that opposes what has just been said: but, however, on the other hand, on the contrary.
- To introduce a concession to an opposing: undoubtedly, to be sure, granted, of course.
- To show that the original line of argument is resuming after a concession: still, nevertheless, nonetheless, all the same, even though.

Some connectors are more difficult to process than others because of their level of formality, less frequent use, and use as internal rather than external relational devices. Halliday and Hasan (1976) adopt four categories of connectors: additive, adversative, causal, and temporal; they subcategorize connectors into those that

are internal. External connectors are those that show a relation between actual real world events and conditions: first one thing and then another; the relationship is in the context of what is being said.

(1) Susan washed the dishes; and, she dried them, too.

The 'and' additive illustrates the use of an external connector. The internal connector, however, relates steps in an argument. The writer wants two sentences added together and reacted to in their totality, in the sense that 'there is yet another point to be taken in conjunction with the previous one.' A large number of formal connectors have this meaning, e.g., furthermore, moreover, additionally, in addition.

(2) My client says he does not know this witness, moreover, he denies ever having seen her or spoken to her.

In sentence two, the 'moreover' additive illustrates the use of an internal connector. The use of internal connectors gives a definite rhetorical flavor to sentences (Halliday & Hason, 1976). Connectors such as 'and,' 'but,' 'or,' and 'so' are considered informal and are used frequently while those like 'accordingly,' 'moreover,' 'hence,' 'still,' and 'even so,' are more formal, less frequently used, and internal.

An informal survey of textbooks used on the secondary and post-secondary levels shows that 'accordingly,' 'moreover,' 'hence,' 'even so,' and 'still,' are used in ninth-grade science texts, tenth-grade literature texts, and twelfth-grade government texts. On the post-secondary level, students are exposed to these connectors in

composition anthologies and introductory psychology texts as well as others. Not only must students know how to use these formal, internal connectors when they read, but they are also expected to use them when they compose. Composition texts direct students to use these connectors as intersentential hooks when they compose compound sentences or as paragraph hooks for successive paragraphs. (Payne, 1975; Frew, Guches, Mehaffy, 1977).

It is clear that students on all levels and from all types of background must learn to make full use of the linguistic resource of formal logical connectors in communicating information if they are to acquire literacy skills. Learning to use these connectors is important for readers to understand passages as a whole. Learning to use them is also important for authors who are expected to write coherently and formally.

PURPOSE This study addresses the questions of whether there are differences in the ability to use connectors between remedial readers and non-remedial readers and between secondary students, technical college students, and regular college students. Five different formal logical connectors were examined in the study for mastery of meaning and use in composing texts. The connectors were the adversatives 'still' and 'even so,' the causal connectors 'hence' and 'accordingly,' and the additive 'moreover.' All of the connectors are examples of formal expressions, and are internal connectors used to link arguments together in a text: all are linguistically more complex than connectors such as 'and' or 'but.' Several research questions present themselves: (a) Is moreover more difficult to use than the connectors 'accordingly,' 'hence,' 'even so,'

and 'still?' (b) Can students produce a synonym for these connectors, indicating they understand their meaning? (c) Can students generate their own compound sentences with these intersentential sentence connectors? (d) Are there differences in students' ability to use these connectors according to student type? (e) Are there differences in the use of these connectors according to level in school?

INSERT TABLE I ABOUT HERE

METHOD

Subjects

The subjects (Ss) for the study were 100 students from remedial and non-remedial reading and composition classes. The schools attended by the subjects were a rural high school, a vocational technical college, and a university, all located in the Midwest. The high school students were white middle-class students in grades nine through twelve. The vocational-technical students were a mixture of white and black, lower and middle-class students who ranged in age from the typical recent high school graduate to middle-age. The university students were primarily white, middle-class students who also ranged in age from recent high school graduates to middle-age.

Materials

The materials for this study consisted of five intersentential connectors presented to the subjects for them to demonstrate their mastery by writing a synonym and generating a compound sentence with the connector used appropriately between the two main clauses in the compound sentence to relate the ideas. The connectors were presented in this order: 'hence;' 'still;' 'accordingly;' 'even so;' and 'moreover.' An example would be:

1. _____ ; hence, _____.

Procedure Subjects were tested in classroom groups. First they were shown two examples which were explained orally. Then they were given the experimental materials. Subjects were instructed to use the following words as connecting words between two related complete thoughts (main ideas or "sentences"). They were told that these words would act as a link or bridge between the two ideas and would point out the relationships of the two ideas to the reader. Then they were asked to provide a substitute word or substitute group of words for the connecting words. They were also instructed to make an educated guess at the synonym if they did not know the meaning. Students were instructed to write the synonym in the circle above the connector.

RESULTS Scoring The subjects' responses were analyzed in terms of their semantic acceptability--that is, whether or not the given connector appropriately expressed the relationship between the main clauses constructed by the subject and whether or not the synonym given was an appropriate substitute for the connector. For each subject two scores were recorded, one for the synonym response and one for the generated main clauses for the compound sentences. Table II shows actual synonym errors made by students in various classes.

INSERT TABLE II ABOUT HERE

The major results of this study are summarized in four tables of error analysis. Relevant concerns were for differences in errors due to (1) connector type and (2) student class level. Table III shows

the proportion of synonym errors made for each connector type by each class. Although the proportion errors clearly drop with increasing class level, the overall 5x5 Chi-square value of 20.40 is not significant. Table IV shows a similar analysis of sentence errors with the same results ($X^2 = 27.62$, n.s.).

INSERT TABLES III AND IV ABOUT HERE

Table V presents the error analysis for the proportion of total errors made by all class levels. Here cell size is sufficient enough to allow a more meaningful computation of x^2 which is significant ($X^2 = 44.20$, $X^2_{.01} = 42.98$). A final analysis is presented in Table VI which shows the proportion of unattempted items by connector type and class level. Again, the X^2 is significant ($X^2 = 37.29$, $X^2_{.05} = 36.42$).

INSERT TABLES V AND VI ABOUT HERE

A further analysis of the proportions presented in Table V indicates the following order of difficulty for the five connectors studied: still and hence < even so < accordingly and moreover. Although the "moreover" connector was numerically the most difficult connector for the Ss to deal with, it was not significantly more difficult than "accordingly."

Students made more synonym errors with 'accordingly' than 'moreover' although the difference was slight. The difference was also slight in the proportion of synonym errors for 'hence,' 'even so,' and 'still;' apparently students find these three connectors equally easy to use.

With respect to student ability to generate compound sentences, the findings show that fewer correct compound sentences were generated for moreover than any of the other connectors. More correct sentences were generated for 'even so' than for any other connector, followed in order by 'still,' 'hence,' and 'accordingly.' 'Moreover' and 'accordingly' were almost equally difficult.

The results of the study also indicate that remedial students in general have more problems with all five of the connectors than the non-remedial students. Surprisingly, the university remedial students made fewer total errors than the university non-remedial students for all connectors except 'even so' on attempted compound sentences. The non-remedial students had fewer unattempted items than the remedial students. The findings indicate that there is a difference in ability to use formal logical connectors according to grade level. High school students find these connectors more difficult to use than college students. The non-remedial high school students had fewer total errors than the remedial technical college students. The high school remedial students and the technical college remedial students look very much alike as do the college remedial and the college non-remedial students.

DISCUSSIONS When one considers the linguistic complexity, the internal usage restrictions on the conjunctions, and frequency of use, the reasons for the order of difficulty described become clear. 'Moreover' and 'accordingly' are polysyllabic in contrast to 'hence,' 'even so,' and 'still' and may be more difficult just because of this factor. 'Accordingly' was consistently confused by students with 'according,' indicating that students do not have adverbs under control and have little facility with the causal

connector 'accordingly.' Moreover is a compound word, but its meaning is not based on the meaning of 'more' added to the meaning of 'over.' Students apparently tried to decompose the word when trying to give a synonym for it, using the word 'more' in their responses: "more than," "more importantly," "more often," "even more," "what is more," "more about." They apparently see moreover as a comparative or as an example of metadiscourse where the author signals to the reader an evaluative comment about what is coming up in the text. They seemed to look at the first element of the word only, disregarding the second root. In addition to seeing moreover as a comparative, they also saw it as a superlative or an emphatic giving synonyms such as "what's worse," "even worse," "on top of it all," and "even greater." Frequently, they gave a synonym of a different conjunction type, demonstrating awareness that moreover was a connector, a signal word needed to relate two sentences. Students used synonyms that were temporal, causal, adversative, and exemplificatory: "later on," "therefore," "even though," "but also," "but," "yet," "hitherto," "however." They also gave other meanings and functions to moreover such as 'just,' 'realistically,' 'bunch,' 'again,' 'in conclusion,' 'that is the way it is,' 'move over,' and 'do again.' Remedial students on the high school level and the technical college level had a tendency to use moreover and other connectors as a verb, changing their function to that of a content word, and perhaps showing their bias for content words.

It is clear that students do not understand what moreover means and do not understand its function as a word that connects ideas in two main clauses. In interviews with students, they related that they

did not know what to do when they met the word in a text and so just skipped over it. When composition books asked them to use the word as a connector between two main clauses, they were puzzled, saying they did not know what to do with the word.

Those process models that view the processor as using the presented words in sentence arrays only occasionally to find cues and confirm predictions such as Schank's computer model (Schank, Lebowitz & Birnbaum, 1978) may be only partially correct. In a recent version of this model, a parser reads only some words, skips others and saves them, or else skips them altogether. Modifiers and function words (articles, prepositions, auxiliaries, conjunctions) are mostly skipped and saved; with striking frequency, they turn out not to be needed at all (Beaugrande, 1980). However, this model presupposes that the parser understands the meaning of the function words and modifiers and their function in an English sentence. Perhaps mature readers can skip and save, but it is doubtful that subjects in this study could save the information to use later although they do skip these words frequently. The computer process model also presupposes a processor who has inference ability that can be used for the skipped modifiers and function words. The texts used with the computer may also have used informal connectors, rather than those that are complex, less frequently used and internal. The model does not take into consideration the developmental trend that was also evident in the results of the study. Students do tend to gain more control over complex connectors as they grow older and experience more formal schooling with the resultant exposure to more expository prose. The fact that few students in high school or college today have experience with

anything other than narrative prose or simplified textbooks could be a factor in their lack of control over 'moreover' and 'accordingly.' Authors are more likely to use these connectors in showing their line of argument in argumentative, persuasive, and cause and effect prose.

Many of the generated sentences of the subjects show their inability to use formal logical connectors such as moreover appropriately. Some of the sentence errors were a result of confusing moreover with a different type of conjunction as the following examples show:

1. The price of gold is dropping; moreover, the dollar is finally rising.
2. Baseball is fun to play; moreover, they will play two games.
3. The clock struck noon; moreover, it was time for lunch.
4. I love to eat; moreover, I want to lose weight.
5. The game has already begun; moreover, I think I'll still try to get in.
6. Some people eat at home; moreover, most people eat out.

Sentences 1-3 require a causal connector and sentences 4-6 require an adversative. Errors like these were more common for non-remedial subjects and the college remedial subjects.

The remedial subjects, in addition to not understanding the meaning of moreover did not understand its function as a connector between main clauses. They frequently used it as a comparitive in a sentence or as a subordinating conjunction as these examples show:

7. They talked moreover the game than our studies.
8. Have you any moreover need for me?
9. You did much more work; moreover, so I'll do the rest.
10. The house is warm; moreover, the thermometer is broken.
11. I don't like to work around factories; moreover, it's hazardous to smell fumes.

12. I really need help in English; moreover, (more than) I need help in algebra.
13. The ducks and geeses walk funny; moreover, than the peacocks and the chickens.

Sentences 7-9 illustrate the comparative sense the students give moreover and the lack of understanding of its function as an intersentential connector. Sentences 10-13 illustrate their use of moreover as a subordinating conjunction. Sentences 10 and 11 illustrate the confusion of moreover with 'because.' Sentences 12 and 13 show the confusion of moreover with the comparative phrase 'more than' which would be used as a subordinating conjunction. Sentence errors like these were more common for remedial subjects in all classes and levels. The number of unattempted generated sentences was higher for remedial subjects, showing their lack of confidence in their ability to use moreover appropriately.

Another problem with student use of moreover in generated sentences is the tendency to use moreover to string sentences together that have no need for each other, do not add to the meaning of each other, and have their own integrity. Remedial subjects tended to use moreover to string sentences together as many students use 'and' to string sentences together. Although sentences like the following are grammatical, they are questionable as to acceptability since the reader must construct a common topic for the two sentences, placing a heavy inferential load on him, requiring more processing time, and often resulting in lack of coherence for the text:

14. He was tall; moreover, he's a fine man.
15. John owns a yacht, and Bill has a lovely home in Scarsdale.

Sentence 14 is similar to sentence 15, Lakoff's example (Lakoff, 1971).

Moreover behaves like the 'and' she calls symmetrical. In both sentences the clauses could be reversed, retain their integrity, are not bound to each other, and require a presupposed common topic. Sentence 14 has the additional problem of two verb tenses, resulting in an even greater processing problem for the reader.

IMPLICATIONS In this study evidence was found that formal intersentential logical connectors are indeed a problem for students of all ages at all levels in both remedial and non-remedial classes. Although a developmental trend was indicated for acquiring control, it was also clear that many students do not acquire mastery of these connectors by the time they are in college. Not only did subjects have problems in giving appropriate synonyms, indicating they would not be able to process texts adequately, but they also had problems in generating sentences where they used formal connectors appropriately. Most of the time they made no attempt to generate a compound sentence at all for moreover and accordingly in contrast to their attempts with the other connectors. When they did attempt sentences, they often used moreover and accordingly inappropriately.

The formal logical connector problem is a significant one since readers who fail to note these connectors or who misunderstand them may interpret the propositions they connect as either totally unrelated or related in ways unintended by the author. Thus, they may comprehend each sentence or clause, but fail to understand the passage as a whole. Conversely, authors who fail to use the connector at all or who use them incorrectly leave their readers guessing about the connections between the ideas they have presented. Single sentences

may be clear; the whole, however, is vague because there are fewer or incorrect clues to the logical relationships among propositions.

Clearly, teachers on both secondary and post-secondary levels have a responsibility to facilitate student mastery of intersentential connectors. Because student textbooks, both grammar and composition, devote few pages, if any, to the study of transitions and connectors, especially formal, complex connectors, teachers will have to devise their own exercises and strategies.

TABLE 1

Distribution of Subjects by Student Type and School

School	Remedial	Non-Remedial
High School	25	18
Vocational Technical College	20	--
University	19	18

TABLE II

Actual Synonym Errors

Classes	Moreover	Accordingly	Hence	Even So	Still
HSR	even so do again more about	preceded directly	go away even though afterward although immediately	exactly although	quiet stopped without move- ment
HSNR	anyhow even greater because	likewise	since still after	also anyway furthermore just	continually even now quiet
TCR	in conclusion because further hitherto higher overcome however yet much whereas on top of it all anyhow realistically	right as usually in order theoretically also nevertheless according to discussion sincerely to act correspond	against then a reason since before now	although because therefore that is the way	silent remain quiet there
CR	even more therefore yet but more than even worse what's more important better yet	also by with		though more anyway	in addition although
CNR	just even though what's worse more impor- tantly therefore for example more than but	as requested even though rightfully but and so now because	now		although also

TABLE III

Proportion of Synonym Errors According to Classes

	HSR I	HSNR II	TCR III	CR IV	CNR V	All Classes
Moreover	.840	.667	.650	.421	.444	.620
Accordingly	.920	.944	.550	.421	.389	.660
Hence	.800	.833	.300	.000	.056	.420
Even So	.880	.833	.200	.158	.278	.490
Still	.840	.778	.400	.105	.111	.470
All Types	.856	.811	.420	.221	.256	.532
N	25	18	20	19	18	100

$X^2 = 20.40$ (n.s.)

TABLE IV

Proportion of Sentence Errors According to Classes

	HSR I	HSNR II	TCR III	CR IV	CNR V	All Classes
Moreover	1.000	.778	.400	.263	.444	.600
Accordingly	1.000	.833	.600	.105	.278	.590
Hence	.960	.833	.350	.000	.000	.460
Even So	.720	.889	.150	.053	.000	.380
Still	.720	.833	.300	.053	.000	.400
All Types	.880	.833	.360	.095	.144	.486
N	24	18	20	19	18	100

$X^2 = 27.62$ (n.s.)

TABLE V

Proportion of Total Errors According to Classes

	HSR I	HSNR II	TCR III	CR IV	CNR V	All Classes
Moreover	1.000	.677	.725	.579	.611	.735
Accordingly	1.000	.611	.700	.395	.555	.675
Hence	.980	.194	.525	.053	.055	.365
Even So	.860	.278	.425	.237	.139	.420
Still	.820	.278	.400	.079	.083	.365
All Types	.932	.406	.650	.268	.289	.512
N	25	18	20	19	18	100

$X^2 = 44.20$

$X^2_{.01} = 42.98$

TABLE VI

Proportion of Unattempted Items According to Classes

	HSR I	HSNR II	TCR III	CR IV	CNR V	All Classes
Moreover	.820	.361	.200	.237	.167	.770
Accordingly	.780	.417	.125	.132	.222	.720
Hence	.700	.028	.025	.053	.028	.400
Even So	.540	.139	.250	.132	.000	.470
Still	.620	.083	.050	.053	.028	.390
All Types	.692	.206	.130	.121	.089	.275
N	25	18	20	19	18	100

$X^2 = 37.29$

$X^2_{.05} = 36.42$

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